R E M A R K S

Attorney for Applicants wishes to thank Examiner Juliana K. Kang for allowing the subject matter of claim 13.

Reconsideration of the above-identified patent application is respectfully requested in view of the foregoing amendments and following remarks. Claims 1 - 4, 6, 8, 9, 11 - 13, 15, 16, 23, 24, 27, and 29 have been amended. Claims 1 - 24, and 27 - 32 remain in this application.

An affidavit swearing back of the GIBONEY et al reference is being submitted under separate cover with detailed proofs.

In accordance with the present invention, there is provided a single package for coupling a multiple channel fiber optic cable to a multiple channel Vertical Cavity Surface Emitting Laser (VCSEL) transmitter and for coupling a second multiple channel fiber optic cable to a multiple channel Perpendicularly Aligned Integrated Die (PAID) receiver. The active surface of both the receiving and transmitting (optoelectronic) dies are oriented perpendicular to the plane of the laminate package. The package can be soldered directly to an end user (host) card and have its cable plugged directly through the tailstock. In other words, the cable can exit from the card in a direction parallel to the plane of the card.

The package article comprises a laminate table or board upon which amplifier dies are supported. The laminate carries an overmold frame that houses, optionally, a faraday barrier shield for RF isolation purposes. The overmold frame supports an optical subassembly, which accepts an optical connector that is attached to an end of the parallel fiber optic cable. A retainer substantially encloses an optical coupler. Attached to the optical coupler is one of a plurality of heat sink carriers, which in turn supports an optoelectronic die. One function of the heat sink carrier is to remove heat from the optoelectronic die. The heat drawn into the heat sink carrier may be dissipated into the nearby air. Optionally, the heat may pass through a heat-conducting adhesive compound to a heat sink package cover where it is then dissipated to the air. The adhesive and cover act as a second heat-dissipating pathway.

The rejection of claims 1 through 9, 12, 14 through 17, 19, and 21 through 31 [sic - claims 15 - 26 were previously withdrawn], based upon 35 U.S.C. §102 as anticipated by GIBONEY et al, claim 10 [sic] as unpatentable over GIBONEY et al under 35 U.S.C. §103, and claims 11, 18, and 32 as unpatentable over ICHINO et al as applied to claims 9 and 16, in further view of HENNINGSSON et al, are respectfully traversed for the following reasons:

a) Applicants conceived their invention prior to the ICHINO et al and GIBONEY et al filing dates, in accordance with the submitted affidavits, and subsequently submitted detailed proofs.

b) The ICHINO et al device does not provide a heat sink carrier that supports an optoelectronic die. One function of the heat sink carrier is to remove heat from the optoelectronic die. ICHINO et al teach no need for such a heat-dissipating device for the optoelectronics. ICHINO et al state, in column 4, lines 59 through 64: "deformation of the retiming circuit IC18 and the like due to heat has no influence on the main amplification circuit ceramic board 16 and the photo detector circuit ceramic board 8."; and again in column 8, lines 5 through 8, ICHINO et al state: "this module is designed to prevent optical axis misalignment due to thermal deformation...." Owing to the fact that ICHINO et al eschew the use of heat dissipation for the optoelectronics, it would not be obvious to add a heat sink as suggested by the rejection. GIBONEY et al does not show the two heat sinks shown and claimed by this invention.

newly added →

c) Applicants do not construct their device using bump bonding, as taught by ICHINO et al.

d) ICHINO et al and GIBONEY et al do not use a molded subassembly as claimed by Applicants.

e) Neither ICHINO et al nor GIBONEY et al show a removable optical coupling, as recited in Applicants' independent claims: 1, 5, 7, etc. ICHINO et al state in column 7, lines 21 through 26: "the photodetector circuit ceramic board 8 of the photodetector circuit unit is soldered to the main amplification circuit."

when unsoldered the optical coupling is removable.

f) GIBONEY et al uses a flexible printed circuit board 25 (FIGURES 8A and 8B), but this is not the flexible circuit cable 28 claimed by Applicants, as shown in (FIGURE 7). ICHINO et al uses "flexible wiring," which is actually closer to Applicants' flexible circuit than the flexible printed circuit board of GIBONEY et al. Note that the IC18 is wire-bonded to the retiming circuit ceramic board 17 and the amplification circuit ceramic board 16 (column 7, lines 63 through 65 in ICHINO et al). Please note wires 19 in column 4, line 24, and FIGURE 1. Note that GIBONEY et al calls for a "flexible circuit board 25" in column 7, lines 34 - 40, but this is not the flexible electrical wiring ribbon cable 28 shown in FIGURE 7 of Applicants' present invention.

g) ICHINO et al and GIBONEY et al do not show a coupling device for coupling a multiple channel fiber optic cable to a multiple channel Vertical Cavity Surface Emitting Laser (VCSEL) transmitter and a multiple channel Perpendicularly Aligned Integrated Die (PAID) receiver as now recited in new claims 31 and 32.

h) HENNINGSSON et al do not teach a Faraday shield that is integrally molded as part of the subassembly.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment, captioned "Version with markings to show changes made."

In view of the foregoing amendments and remarks, Applicants respectfully request that claims 1 - 24 and 27 - 32 be allowed and that the application be passed to issue.

Respectfully submitted,

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks Washington, D.C. 20231

on 7/8/02 (Date of Deposit)

7/8/02 Date

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Version With Markings To Show Changes Made

IN THE CLAIMS:

Claims 1 - 4, 6, 8, 9, 11 - 13, 15, 16, 23, 24, 27, and 29 have been amended as indicated.

1. (Amended) A package article for removably accepting a fiber optic cable, said package article being adaptable for operatively [connected] connecting to a host card, comprising:

a laminate for supporting optoelectronic components;

an amplifier die operatively connected to and supported by said laminate for amplifying electrical signals;

a flexible circuit electrically connected to and supported by said laminate for receiving said amplified electrical signals from said amplifier die; and

an optoelectronic die electrically connected to said flexible circuit for receiving said amplified electrical signals generated by said amplifier die and for generating optical signals responsive thereto.

2. (Amended) The package article for removably accepting a fiber optic cable [operatively connected to a host card] in accordance with claim 1, said package article further comprising:

a heatsink carrier operatively connected to said flexible circuit, and attached to said optoelectronic die for removing heat therefrom.

3. (Amended) The package article for removably accepting a fiber optic cable [operatively connected to a host card] in accordance with claim 1, said package article further comprising:

an optical subassembly <u>having means for optically aligning</u> [in optical communication] with said optoelectonic die for receiving and processing said optical signals therefrom, said optical subassembly

comprising an optical coupler and a removable optical connector having an optical cable.

4. (Amended) An optoelectronic subassembly for accepting optical signals from a fiber optic cable, said optoelectronic subassembly [being] having means for operatively [connected] connecting to a host card, said optoelectronic subassembly comprising:

an optoelectronic die for receiving electrical signals and for generating optical signals responsive thereto;

a flexible circuit electrically connected to said optoelectronic die;

an optical coupler optically connected to said optoelectronic die for receiving optical signals therefrom; and

a heatsink carrier operatively connected to said flexible circuit, and attached to said optoelectronic die for removing heat therefrom.

6. (Amended) The optoelectronic subassembly for accepting optical signals from a fiber optic cable in accordance with claim 5, wherein said optical connector further comprises an [optical] optic cable.

8. (Amended) The package article in accordance with claim 7, further comprising:

a laminate for supporting optoelectronic components;

an amplifier die operatively connected to and supported by said laminate for amplifying electrical signals;

an optical subassembly in optical communication with said optoelectronic die for receiving and processing said optical signals therefrom, said optical subassembly

comprising an optical coupler and a removable optical connector having an [optical] optic cable; and

a retainer operatively connected to said optical coupler and removably connected to said optical connector for aligning said optical coupler and optical connector.

9. (Amended) A package article for removably accepting a horizontally oriented fiber optic cable, and being adaptable to operatively [connected] connecting to a host card, comprising: a flexible circuit disposed between at least one translating die operatively connected to a laminate, and an optoelectronic die; [at least one] means defining two heatsink [carrier] carriers; [a] said horizontally oriented fiber optic cable connected to said at least one translating die such that said fiber optic cable exits from said laminate in a direction substantially parallel to a horizontal plane defining an orientation of said laminate; an overmold frame that is supported by said laminate, said overmold frame having a cavity for receiving said flexible circuit, said optoelectronic die and said at least one heatsink carrier; [said] at least one of said heatsink [carrier] carriers being

operatively connected to said optoelectronic die; said cavity of said overmold frame enclosing and securing [said] at least one heatsink carrier, said optoelectronic die and said flexible circuit.

11. (Amended) The package article in accordance with claim 9, further comprising at least one faraday barrier shield[,] supported by said overmold frame housing, said at least one faraday barrier shield providing RF isolation of said [at least one] optoelectronic die.

12. (Amended) The package article in accordance with claim 9, further comprising a fiber optic coupling disposed between said optoelectronic die and said [at least one] fiber optic cable.

13. (Amended) The package article in accordance with claim 12, further comprising a retainer, and wherein said fiber optic coupling disposed between said optoelectronic die and said [at least one] fiber optic cable is snap connected to said retainer, said retainer being attached to said heatsink carrier.

15. (Amended) The package article in accordance with claim 12, wherein said fiber optic coupling comprises an optical coupler connected to said optoelectronic die at one end, said optical coupler being attached to an optical connector at an opposite end, said optical connector being connected to said [at least one] fiber optic cable.

16. (Amended) A package article for coupling a horizontally oriented set of fiber optic cables to vertically oriented translating dies, comprising: at least one fiber optic cable, said at least one fiber optic cable being oriented substantially parallel to a plane defining a substantially horizontally oriented laminate, a flexible circuit operatively disposed between said laminate and said at least one fiber optic cable, such that said at least one fiber optic cable exits from said laminate in a direction substantially parallel to a horizontal plane defining an orientation of said laminate, an overmold frame that is supported by said laminate, a heatsink carrier [with] and at least one optoelectronic die supported by[,] said overmold frame, said overmold frame having a cavity for receiving said

flexible circuit, said at least one optoelectronic die and said heatsink carrier.

23. (Amended) A transmitting optoelectric subassembly for accepting a parallel fiber optic connector that is secured to one end of a parallel fiber optic cable, comprising:

an optoelectronic subassembly comprising a transmitting optoelectronic device secured to a carrier, an electrical signal transfer device, and an optical coupler signal transfer device both being secured to a retainer and to said carrier; and

an electronic subassembly comprising an overmold frame secured to a laminate and to said retainer.

24. (Amended) The package in accordance with claim 23, wherein said electrical signal transfer device electronically couples an electronic signal from said [laminate] electronic subassembly to said transmitting optoelectronic device, said transmitting optoelectronic device converts said electronic signal to an optical signal, said optical signal transfer

device optically couples said optical signal to said parallel fiber optic connector, and said retainer removably retains said parallel fiber optic connector.

27. (Amended) A method for coupling at least one fiber optic cable to at least one translating die, comprising:

applying an electrical signal from an amplifier die to a flexible circuit disposed on a laminate to which a host card [is] <u>can be</u> electrically connected;

converting said electrical signal to an optical signal; and

applying said optical signal to an optical coupler for transmitting said optical signal to an optical connector attached to said at least one fiber optic cable.

29. (Amended) The method for coupling at least one fiber optic cable to at least one translating die in accordance with claim 28, the steps further comprising:

providing a plurality of heatsink [carrier] pathways [operatively connected to said at least one translating die] for performing said heat removing step.